TECHNICAL SPECIFICATION FOR 3 PHASE, 4 WIRE A.C. STATIC L.T.

TRIVECTOR METER WITH TOD FACILITY AND DLMS ICS COMPLIANT, 5A, 240V (415V), CATEGORY-C FOR CONSUMER METERING /DISTRIBUTION TRANSFORMER METERING APPLICATION

Enquiry No:- BESCOM/GM (M&C)/126/RO/2023-24

1. SCOPE :

(i) This specification covers the design, manufacture, testing before despatch, supply and random testing after delivery of ISI-marked of class 0.5S accuracy static LT Trivector Meters for consumer metering/Distribution transformer metering purpose as per requirement given in this specification. The meter should be 3 phase 4 wire CT/PT operated fully static and AMR Compatible Trivector Energy meter type. The meter should be capable to record and display active, reactive, apparent and maximum demand in apparent for 3 phase 4 wire AC balanced/unbalanced loads for a power factor range of zero (lagging), unity and zero (leading) as per requirement given in this specification. Meters shall be supplied along with base-computer software's (BCS) as per the details given in this specification.

(ii) It is not the intent to specify completely herein all the details of the design and construction of material. The material shall, however, conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing for continuous commercial operation in a manner acceptable to the purchaser.

2. STANDARDS APPLICABLE :

Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian/International Standards and all related Indian/International standards to be read with upto-date and latest amendments/revisions thereof:

Sr. No.	Standard No.	Title
1	IS 14697-1999	AC Static Transformer Operated Watt-hour and VAR-Hour Meters, class 0.2S & 0.5S.
2	CBIP report No.325 latest amendments	Specification for AC Static Electrical Energy Meters
3.	CBIP Technical report no. 111	Specification for common Meter Reading Instrument
4.	IEC-62052-11-	Electricity metering equipments (AC)- General Requirements & test conditions Part 11. metering equipments
5.	IS :9000	Basic Environmental Testing Procedures for Electronic & Electrical Items.

6.	**ICS-BIS-ETD 13-6211-APR2010**	**Indian companion standard as applicable.**
7	IS 15959:2011	Data exchange for electricity meter reading, tariff and load control-ICS (DLMS)
8	IEC 62053-22	Electricity Metering equipment AC Part-22-static meter for active energy (Classes 0.2s and 0.5s)
9	IEC 62056-21	Electrical and mechanical requirements for meters

Meters matching with requirements of other national or international standards, which ensure equal or better performance along with the standards mentioned above, shall also be considered. When the equipment offered by the tenderer conforms to standards those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant schedule and copy of such standards along with their English translation shall invariably be furnished along with the offer.

3. General Technical Requirements :

1	**TYPE**	**AMR Compatible Static, 3 Ph 4 Wire Electronic Trivector Energy Meter**
2	**FREQUENCY**	**50 Hz ±5%**
3	**ACCURACY CLASS**	**0.5S**
4	**SECONDARY VOLTAGE**	**Suitable for operation from 415V Ph-Ph/or 240 V Ph-N**
5	**BASIC CURRENT (Ib)**	**-/5 Amps.**
6	**MAXIMUM CONTINUOUS CURRENT**	**2.0 Ib; Starting and Short time current shall be as per IS-14697**
7	**POWER CONSUMPTION**	**i) The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 1. 5 W and 8 VA. ii) The apparent power taken by each current circuit, at basic current, reference frequency and reference temperature shall not exceed 1.0 VA**
8	**POWER FACTOR**	**0.0 Lag -Unity- 0.0 Lead**

4. DESIGN:

Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be

assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.05 class) software based test bench.

5. CLIMATIC CONDITIONS:

As per IS 14697-1999 (reaffirmed 2004) meter to perform satisfactorily under non air conditioned environment (within stipulation of IS).

Meter body will confirm to IP 51 degree of protection. For outdoor use meter shall be installed in sealed enclosure conforming to IP 55.

The meters shall be suitably designed and treated for normal life and satisfactory operation under the hot and hazardous tropical climate conditions. and shall be dust and vermin proof. All the parts and surfaces which are subjected to corrosion shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injuries effect of excessive humidity. The meter shall be required to operate satisfactorily and continuously under the following tropical climatic conditions:

i)	Temperature	4° C to 55°C (45°C in shade)
ii)	Relative Humidity	10% - 100% (Sometimes approaches to saturation)
iii)	Average annual rainfall	3000 mm
iv)	Max. wind pressure	150 Kg per Sq. mm
v)	Max. altitude	1000 meters.
vi)	Average No. of dust-storm days per annum	40 days -.-
vii)	Average no. of rainy days per annum	90 days
viii)	No. of months of tropical Monsoon conditions per Annum	3 months
ix)	**Isoceraunic level**	56 days

Extra precaution in Meter manufacturing shall be taken while designing the meter considering Isoceraunic level in the BESCOM areas for preventing failure of meters due to lightning surges & high humidity during monsoon period

6. SUPPLY SYSTEM :

Rated Voltage (Vref) 3 x 240 V - Phase to Neutral
(3 phase 4 wire system)

3 x 415 V - Phase to Phase

Rated current (Ib) 3 x -/5 Amps
(Connected through CT)

Multiplying factor to arrive at actual primary values wherever applicable shall be calculated from the CT ratio of the installed CTs i.e. meter shall read in secondary values of voltage and current.

7. POWER FACTOR RANGE :

The meter shall be suitable for full power factor range from zero (lagging) through unity to zero (leading).

8. POWER SUPPLY VARIATION :

The extreme power variation for which an operating meter should withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its normal operating conditions shall be as follows:
Specified operating range - 0.8 to 1.1 V ref.
Limit range of operation - 0.6 to 1.2 V ref.
The limits of error for voltage variation of +20% to – 40% of V ref shall be as under:

Influence Quantities		Value of current	Power Factor	Limits of variation in percentage error
				0.5S
i	Voltage variation between -40% to +20%	Ib	1	**0.2**
		Ib	0.5 lag	**0.4**
ii	10% of 3rd harmonic in current circuit	0.6Ib	UPF	0.1
		0.6Imax	UPF	0.1

Frequency -47.5 Hz to 52.5 Hz. (Reference frequency 50 Hz.)

9. ACCURACY:

Class of accuracy of the meter shall be 0.5S. The accuracy should not drift with time.

10. POWER CONSUMPTION:

(i) Voltage circuit: The active and apparent power consumption in each voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency shall not exceed 1.5W per phase and 8VA per phase respectively

ii) Current circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 1 VA per phase.

11 STARTING CURRENT:

The meter should start registering the energy at 0.1% Ib and unity power factor.

12. MAXIMUM CURRENT:

The rated maximum current of the meter shall be 200% Ib.

13. GENERAL AND CONSTRUCTIONAL REQUIREMENTS:

i) Meters shall be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However the following should be ensured :-

a) Personnel safety against electric shock
b) Personnel safety against effects of excessive temperature.
c) Protection against spread of fire.
d) Protection against penetration of solid objects, dust and water.

ii) All the materials and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

iii) The meter shall be designed with application specific integrated circuits. The electronic components shall be mounted on the printed circuit board using latest Surface Mount Technology (SMT).

iv) All insulating materials used in the construction of meters shall be non- hygroscopic, non-aging and of tested quality.
All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

v) The meter shall have an operation indication device such as a blinking LED/LCD. The operation indicator shall be visible from the front window.

vi) The meter shall conform to the degree of protection IP 51 of IS 12063/IEC: 529 for protection against ingress of dust, moisture and vermins.

vii) The meter shall be supplied with a transparent extended terminal-block cover
(ETBC).

viii) The meter-base, meter-cover, terminal block and ETBC shall be made of unbreakable, high grade, fire- resistant, reinforced, non-inflammable, high-grade and good quality engineering plastic.

ix) The meter-cover shall have one window. The window shall be of transparent, UV stabilized polycarbonate *(shall confirm to IS 11731 FH 1 Category besides meeting the test requirement of heat deflection test as per ISO 75, Glow wire test as per IS 11000 part 2/Sec-1-1984 or IEC PUB,60695-2-12, Ball pressure test as per IEC 60695-10-2 & Flammability test as per UL 94 or as per IS 11731 part 2 1986)* or equivalent high grade engineering plastic for easily reading all the displayed values/parameters, name plate details and observation of operation indicator. The window shall be ultra-sonically welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover seals, even in case of transparent meter cover which has separate window.

x) The terminal block, the ETBC and the meter case shall ensure reasonable safety against the spread of fire and should not be ignited by thermic overload of live parts in contact with them.

xi) The terminal block shall be of high grade non-hygroscopic, fire-retardant, low-tracking, fire-resistant, high grade engineering plastic.

xii) The meter shall have nickel-plated brass terminals. The terminals shall have suitable construction with barriers and cover to provide firm and safe connection of current and voltage leads of stranded copper conductors with copper reducer type terminal ends (thimbles).

xiii) The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw into a metal nut. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Two screws shall be provided in each current terminal for effectively clamping the external leads or thimbles. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The internal diameter of the terminal holes shall be minimum 5.0 mm. The clearances and creepage distances shall conform to clause 6.6 of IS 14697:1999.

xiv) The meter shall be compact in design. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibrations during transportation and handling.

14. MANUFACTURING PROCESS, ASSEMBLY & TESTING:-

Meters shall be manufactured using latest & 'State of the Art' technology & methods prevalent in electronics industry. The meter shall be made from

High Accuracy & reliable surface mount technology (SMT) components. All inward flow of major component & sub assembly parts (CT, PT, RTCs/Crystal, LCDs Power circuit electronic component etc shall have batch and source identification. Multilayer 'PCB' assembly 'PTH' (plated through hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB' for soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs/C-MOS components , to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test Equipment.
Fully assembled and finished meter shall undergo 'burn-in' test process for 12 hrs at 55 degree Celsius (Max. temperature not to exceed 60 degree Celsius) under base current (Ib) load condition.
Test points should be provided to check the performance of each block/stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

15. SEALING OF THE METER:

The meter shall be factory calibrated and sealed suitably before dispatch.
Good quality seals should have six digits non repeated numbers with embossing on both sides - one side with the logo of the manufacturer and the on the other side the logo of the concerned ESCOM. Only patented seals (seals from the manufacturer who has official right to manufacture the seal) shall be used. Seals can with stand up to 270 deg C, so that it can not be tampered by boiling like ordinary plastic seals. Two sealing screws shall be provided for proper sealing of the meter cover so that access to the internal part shall not be possible without breaking the seal.
Additionally, two sealing holes shall be provided on meter case suitable for inserting sealing wire of min. 2mm dia.
Two no. of sealing screws should also be provided to seal the terminal cover
by the purchaser.
The above sealing inserting arrangement shall be integral part of moulded case. The provision of sealing shall also be integral part of the meter and the seals shall not be supplied loose with the meter.
A tracking and recording software for all new seals shall be provided by the manufacturer of the meter so as to track total movement of seals starting from manufacturing, procurement, storage, record keeping, installation, series of inspections, removal and disposal.

16. MARKING OF METER :

The meter terminal marking and mounting arrangement should be as per Indian installation practices.

The marking on every meter shall be in accordance with IS 14697-1999 .

Every meter shall have name plate beneath the meter cover such that the name plate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover and the name plate shall be marked indelibly. The name plate marking should not fade or otherwise be adversely affected by UV exposure with lapse of time. The basic markings on the meter name plate shall be as follows: -

i. Manufacturer’s name and trade mark.
ii. Type Designation.
iii. Number of phases and wires.
iv. Serial number.
v. Month & year of manufacture with bar code.
vi. Reference voltage.
vii. Rated secondary current of CT (-/5 A).
viii. Principal unit(s) of measurement.
ix. Meter constant
x. Class index of meter.
xi. “Property of BESCOM".
xii. Purchase Order Number & Date.
xiii. IS and S mark
xiv. Category Type
xv. TOD Zone Timing

17. CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter shall be indicated on inside portion of extended terminal block cover showing connections from CT's to meter. The meter terminals shall also be marked and this marking should appear in the above diagram.

18. SOFTWARES:

The BCS software shall be made available and shall be installed on BCS by the Supplier**.**.

1) Software for reading, down loading data of the meter time, setting and TOD programming in the meter, normally resident in the Common Meter Reading Instrument (CMRI); The software shall be supplied separately in the form of floppies/CDs.

2) Windows based Base Computer Software (BCS) for receiving data from CMRI and downloading instructions from base computer to CMRI. This BCS should have, amongst other requirements and features and facilities

described later in this specification, the facility to convert meter-reading data into user definable ASCII file format.

19. SALIENT FEATURES:

The meter shall have the following additional salient features:

1. Additional indicators shall be provided on display to show healthiness of phase voltage.

2. Meter shall have Scroll Lock facility to display any one desired parameter continuously from display parameters.

3. The meter shall have provision to display & download data in **during power supply failure through an Internal battery/ Super Capacitor** as per provision of Annexure: G-14 of IS 14697-1999 such that it should not be possible to damage the circuitry of the meter by applying excess voltage directly in the meter.

4. The meter should work accurately irrespective of phase sequence of the mains supply.

5. The meter should remain powered up and functional even when either of any two phases or any one phase along with neutral is available to the meter.

6. The meter should continue to record accurately even if the neutral of potential supply gets disconnected.

7. The meter shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in CBIP Technical Report **No.325** (with latest amendments) applied on the meter shall not affect the proper functioning and recording of energy as per error limits prescribed by CBIP.

   The accuracy of the meter should not be affected with the application of abnormal voltage/frequency generating device such as spark discharge of approximately 35 kV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

   i) On any of the phases or neutral terminals.

   ii) On any connecting wires of the meter.

   iii) Voltage discharge with 0-10 mm spark gap

   iv) At any place in load circuit

   The accuracy of meter shall be checked before and after the application of above device(s) with site conditions. Also, meter shall be tested for Immunity to Conducted Disturbances in accordance to IEC 62052-11 and any other tests as per relevant standards can be carried out.

   The bidder should furnish the details as to how their meter

is able to detect/protect the above tampers and fraud with sketches and phasor diagrams wherever necessary. If bidder has any better proposal for tamper logic, the same may be submitted along with the offer for purchaser's consideration. Additional features, If any, in their meter may also be clearly indicated.

8. a) The meter shall record active energy in forward direction even if one or more CT's are reversed.
The current vector direction shall always be considered as positive (import) for the computation of 3 Phase active energy which shall be added in the main active energy (import) register.
b) The meter shall record apparent energy in forward direction even if one or more CT's are reversed. KVAh computation shall be based on reactive lag energy only. However provision shall be made to compute KVAH on lag and lead energies if required in future.
c) The maximum demand shall be computed from the main active energy registers. However there should be provision to select apparent energy as demand whenever required.

9. The meter cover should be ultrasonically welded with meter base. The cover shall not just be held with base on two points of sealing. It should be supported all along the boundary of base and cover of the meter as well, so that even before ultrasonic welding, the cover should be fit perfectly with the base. The ultrasonic welding of meter case shall be such that if in case of any attempt to open the meter cover from base, there should be a clearly visible evidence of opening / tampering of meter case, **meter shall display "tamper" permanently.**

20. Deleted

21. Deleted

22. PERFORMANCE UNDER IN FLUENCE QUANTITIES:

The meters performance under influence quantities shall be governed by IS 14697-1999 (reaffirmed 2004). The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 14697 (latest version).

23. QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA kW kVAr, power factor, frequency etc as per details given in the table below and enclosed annexure.

b) Block Load Profile Parameters such as kVAh/kWh/kvArh (lag/lead)/ Maximum Demand (MD) in kW/kVA/power factor/phase and line

voltages/currents etc (minimum 5 parameters) as per details given in the table below and enclosed annexure.

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters (Table A5.1, A5.2 and A6.1 to A6.8 respectively of enclosed guideline document)
Detail of category wise parameters requirement suitable for specific location such as feeder/DT metering, interface points/boundary points is given in following tables of guidelines document enclosed as annexure:

Category	Parameter group	Annexure Table:No.
Substation Feeder/ Distribution Transformer meter	Instantaneous parameters	All
	Block Load Profile parameters	A2.2
Boundary/Ring fencing/Interface Meters	Instantaneous parameters	A3.1
	Block Load Profile parameters	A3.2
	Daily Load Profile parameters	P3.3
HT Consumer Meters	Instantaneous parameters	A4.1
	Block Load Profile parameters *	A4.2
	Billing Profile parameters	A4.3
Substation Feeder! Distribution Transformer/Boundary/Ring fencing/lnterface/HT Consumer Meters	Name Plate details	A5.1
	Programmable Parameters	A5.2
	Event Conditions	A6.1 to A6.7
Logging parameters for each of the event condition — shall be selected	Capture parameters for event Afr8.. as applicable (Event Log Profile)	

24. METER SERIAL NUMBER :

In addition to providing serial number of the meter on the display plate, the meter serial number shall also be programmed into meter memory for identification through CMRI/meter reading print out.

25. DISPLAY SEQUENCE :

The meter shall display the required parameters in two different modes as follows:-

A) Auto Display Mode:

The following parameters hereinafter referred to as "Billing Parameters" (B.P) shall be displayed in an auto-cyclic mode, in the following sequence with a persistence time of 9-10 seconds.

1	LCD Check
2	Meter Serial Number
3	Date & Time
4	First Previous Month Cum kWh (b1)
5	Second Previous Month Cum kWh (b2)
6	First Previous Month MD in kW with date& Time (b1)
7	Billing Avg Power factor
8	Billing KVAh
9	Billing Power on Time in Days:Hours:Minutes
10	Phase wise Currents
11	Phase wise Voltages
12	Phase wise Instantaneous pf
13	Instantaneous total pf
14	Phase sequence
15	Frequency
16	Instantaneous Apparent Power
17	Instantaneous Active Power
18	Instantaneous Reactive Power
19	Power Failure Count
20	Total Power Failure Hours
21	Total Tamper Count
22	Anamoly
23	Reset Count
24	Running MD in kW with date & Time
25	Cumulative kWh
26	Cumulative Lag kVArh
27	Cumulative Lead kVArh
28	Cumulative Apparent Energy

B) Push Button Mode:

The following parameters, in the sequence given below, shall be displayed on pressing the push button(s) ,two buttons for up and down navigation of parameters to be provided:

	Push Mode
1	LCD Check
2	Meter Serial Number
3	Date & Time
4	First Previous Month Cum kWh
5	Second Previous Month Cum kWh
6	First Previous Month MD in kW with date& Time
7	Billing Avg Power factor
8	Billing KVAh
9	Phase wise Currents
10	Phase wise Voltages
11	Phase wise Instantaneous pf
12	Instantaneous total pf
13	Phase sequence
14	Frequency
15	Instantaneous Apparent Power
16	Instantaneous Active Power
17	Instantaneous Reactive Power
18	Power Failure Count
19	Total Power Failure Hours
20	Total Tamper Count
21	Anamoly
22	Reset Count
23	Running MD in kW with date & Time
24	Cumulative kWh
25	Cumulative Lag kVArh
26	Cumulative Lead kVArh
27	Cumulative Apparent Energy
28	Cumulative MD in KW
29	Phase wise Voltage Failure Count
30	Current Open Status Count

31	Voltage Unbalance Count
32	Current Unbalance Count
33	Current Bypass Count
34	Current Reversal Count
35	Over Voltage Count
36	Over Current Count
37	Neutral Disturbance Count
38	Magnetic Tamper Count
39	Cover Open Status
40	Date & Time of Cover Open
41	RTC status
42	Battery status
43	First Previous Month billing Energy in kWh
44	Second Previous Month billing Energy in kWh
45	Third Previous Month billing Energy in kWh
46	Fourth Previous Month billing Energy in kWh
47	Fifth Previous Month billing Energy in kWh
48	Sixth Previous Month billing Energy in kWh
49	First Previous Month billing MD in kw
50	Second Previous Month billing MD in kW
51	Third Previous Month billing MD in kW
52	Fourth Previous Month billing MD in kW
53	Fifth Previous Month billing MD in kW
54	Sixth Previous Month billing MD in kW
55	First Previous Month billing pf
56	Second Previous Month billing pf
57	Third Previous Month billing pf
58	Fourth Previous Month billing pf
59	Fifth Previous Month billing pf
60	Sixth Previous Month billing pf
61	Zone wise billing C kWh and MD in kw of previous month (b1)
62	Zone wise Cumulative kWh and MD in kw
HR Mode: (2+6)	

1	Cumulative kWh, kVArh lag & lead, kVAh

The following parameters shall be displayed on demand.

(i) High-resolution display of cumulative KWh, KVAh & RKVAh shall be of minimum eight digits, with two digits for integers and six digits for decimals.
(ii) Demand with elapsed time.
(iii) Cumulative period of failure of potential in each phase shall be displayed in **days / hours / minutes** from the date of Installation.
(iv) Cumulative period of failure of current in each phase shall be displayed in **days / hours / minutes** from the date of Installation.
(v) Cumulative period of failure of power shall be displayed in **days / hours / minutes** from the date of Installation.
(vi) Tamper Count (First in, First out basis)

Note: Failure of potential, failure of current and failure of power shall be displayed in **days / hours / minutes** from the date of installations. 6 months/of billing parameters should be provided in demand mode.

CT Operated push button display:

					TOD for six month		
Months	MD	Energy				MD	Energy-1
Aug. (Current month)	MD	kWh	kvah	PF	1	MD0	C0
July	MD1	kWh1				MD1	C1
June	MD2	kWh2				MD2	C2
May	MD3	kWh3				MD3	C3
April	MD4	kWh4			2	MD0	C0
March	MD5	kWh5				MD1	C1
February	MD6	kWh6				MD2	C2
						MD3	C3
					3	MD0	C0
						MD1	C1
						MD2	C2
						MD3	C3
					4	MD0	C0
						MD1	C1
						MD2	C2
						MD3	C3
					5	MD0	C0
						MD1	C1

						MD2	C2
						MD3	C3
					6	MD0	C0
						MD1	C1
						MD2	C2
						MD3	C3

C. Battery mode parameters : The meter shall have industrial grade rechargeable long life battery with sufficient capacity to enable the meter reader to take meter reading even under power off conditions. The same push button shall be used for displaying the readings included in auto scroll mode only during power outages.

26. OUT PUT DEVICE :

The meter shall have a test output accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator, if fitted, must be visible from the front. Test output device shall be provided in the form of LED/LCD(s) for active and reactive energies. **Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes.**

27. Real Time Internal Clock (RTC)

RTC shall be pre-programmed for 30 Years Day/date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year.

The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

a) Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger ‘PC’.

28. DEMAND INTEGRATION PERIOD

The maximum demand integration period shall be set at 30 minute & provision shall be made to program the period to 15 minute.

29. MD RESET

It should be possible to reset MD by the following options:

a) Local push button

b) Auto reset at 24:00 hrs at the end of each billing cycle.

c) The meter shall be capable of resetting MD even when there is no power supply during whole month.

30. COMMUNICATION CAPABILITY

The meter shall be provided with two ports for communication of the measured/ collected data, i.e a hardware port compatible with RS 232 port shall be of RJ 11 type connectivity to enable RAMR specifications which shall be used for remote access through suitable Modem (GPRS/GSM/EDGE /CDMA/PSTN/LPR) and an Optical port complying with hardware specifications detailed in IEC-62056-21. This shall be used for local data downloading through a DLMS compliant HHU.

The RS 232 port shall be used at boundary points meters, Distribution Transformer meters for consumer meters, capable to transfer and export data to the remote end server through, suitable communication mediums (GPRS/ GSM/ EDGE/ CDMA/PSTN/LPR) **RS 232** port shall support the default and minimum baud rate of 9600 bps.

31. MAXIMUM DEMAND (MD) REGISTRATION :

The meter shall continuously monitor and calculate the average demand in active energy during the integration period set and the maximum, out of these, shall be stored along with date and time when it occurred in the meter memory. The maximum registered value shall also be made available on meter-display.

The rising demand under the current integration period should be displayed along with the elapsed time.

The integration period shall be set as 30 minutes, on real- time basis. The meter shall have provision for maximum demand resetting through sealable push button and automatically at 24.00 hours of the last day of the calendar month irrespective of the meter is powered On or Off during the whole month. The meter shall display the maximum demand reset count. All MD reset shall be recorded as an event.

32. MAXIMUM DEMAND RESET :

Facility for auto reset of MD at predefined date & time shall be provided. The meter shall display the maximum demand reset count.

33. LOAD SURVEY CAPABILITY & BILLING POINT REQUIREMENTS :

a) The meter shall be capable for storing ½ hour data for the following parameters for the last 35 days and necessary facilities to transfer this data for easy communication to data collection device i.e., MRI / Hand Held Reader (H.H.R) or PC to get the details in both numerical and graphic forms. The supply of required software for this purpose is included in the scope of supply. The software shall be compatible for use with IBM compatible PC and also with both serial port and USB port The meters have the RRAMR interface facilities.

Parameters required for load survey:

- **KWH**
- **KVAh**
- **KVArh lag**
- **KVArh lead**
- **Voltage (avg. of 30 – min period) phase wise**
- **Current (avg of 30 – min period) phase wise.**

The predefined date and time for registering the billing parameters of active, apparent, power factor and apparent Maximum Demand readings shall be 00.00 hours of the first day of each calendar (billing) month. All billing parameters shall be transferred to billing registers and shall be displayed on auto cyclic display mode referred to as "BILLING PARAMETERS". Additionally manual resetting shall be provided using a push button.

The following additional parameters should be made available at the Base Computer Software (BCS) end:

a) MD reset count.
b) Billing Parameters for last 6 Histories.

34. TIME-OF-DAY (TOD) TARIFF/DEMAND :

Minimum of Eight TOD shall be provided and each TOD shall have display of import of KVAh, KWh, MD in KW, KVA, Avg, P.F. and facility to down load through MRI to PC and print out.

Following zones are to be pre-programmed in the meter. Necessary software shall be provided in MRI for changing these zones if required in future

The present time zones are as follows.

TZ1- 06:00 Hrs to 10: 00Hrs
TZ2- 10:00 Hrs to 18: 00Hrs
TZ3- 18:00 Hrs to 22: 00Hrs
TZ4- 22:00 Hrs to 06: 00Hrs

Suitable software for invoking display parameters pertaining to these TOD’s in auto scrolling mode & change in TOD zones.

35. SELF DIAGNOSTIC FEATURE :

The meter shall have indications for unsatisfactory / nonfunctioning / malfunctioning of the following:

(a) Time and date on meter display.
(b) All display segments on meter display
(c) Non Volatile Memory Status on display and downloaded data.

36. Tamper Events Detection:

The meter shall work satisfactorily under presence of various influence conditions like external magnetic field, electro magnetic field Radio Frequency Interference, Harmonic distortion, Voltage/frequency Fluctuations & Electro Magnetic High Frequency fields etc,

The meter shall be immune to abnormal voltage/frequency Generating devices & shall record the occurrence & restoration of such tamper events along with parameters such as current, voltage, KWh, PF event code, date & time & etc. Tamper detail shall be stored in internal memory for retrieval by authorized personnel through either of the following:

1. HHU
2. Remote access through suitable communication network.

The meter should have features to detect the occurrence and restoration of, at least, the following common ways of abnormalities:

- **Potential failure:** The meter shall be capable of detecting and recording occurrences and restoration of potential failure (one phase/two phases) which can happen due to intentional / accidental disconnection of potential leads. The meter should also record event as a potential failure, when one phase line fuse failure from the main side.

- **Current Polarity Reversal:** The meter shall be capable of detecting and recording occurrences and restoration of current polarity reversal of one or more phases which can be happen due to wrong connection of current leads.

- **Current Circuit Open:** The meter shall be capable of detecting and recording occurrences and restoration of opening of any one or two phases of current circuit which can happen due to intentional / accidental disconnection of current circuits. “No load” condition should not be recorded in meter memory as a Current circuit open event.

- **Current Unbalance:** The meter shall be capable of detecting and recording occurrences and restoration of current unbalance as an event.

- **Voltage Unbalance:** The meter shall be capable of detecting and recording occurrences and restoration of voltage unbalance as an event. The above information should be possible to download from the meter through hand held unit and available at BCS end.

- **Power on/off**: The meter shall be capable to record power on /off events in the meter memory. All potential failure should record as power off event.

- Minimum three hundred (300) events (including occurrence & restoration) of all types of abnormality event with date and time shall be available in the meter memory on first-in, first-out basis. It shall be possible to retrieve the event data along-with all related snap- shots' data through the meter's optical port and through radio with the help of a hand held unit (HHU) and download the same to the BCS where it shall be available for viewing.

  The meter shall be capable of storing any continuous failure/tamper until it is set right.
  Tamper and fraud protection clause shall be included as per IS 15959 and 0.2s class meter specification

37. Event Detection Logic :

Properly designed meter tamper logic should be provided. The tamper logic should be capable of discriminating the system abnormalities from source side and load side.

There shall be compartments for logging of different types of tampers.

The logging of various tampers in each compartment should be explained by bidder.

Once one or more compartments have become full, the last tamper event pertaining to the same compartment will be entered and the earliest (first one) tamper event should disappear. Thus, in this manner each succeeding tamper event will replace the earliest recorded event, compartment wise. Events of one compartment/category should overwrite the events of their own compartment/category only.

Tamper count should increase as per occurrence (not restoration) of tamper events. The total number of tamper counts should also be provided on the meter-display as well as at the BCS end.

38. EVENT PERSISTENCE TIME:

The persistence time for logging/ registration of an occurrence & restoration of the tamper should be explained by the supplier.

39. ACCURACY REQUIREMENT :

The accuracy of parameters measured by meters shall be tested in accordance with the relevant standards described in clause 2.0 of this specification.

40. ELECTRICAL REQUIREMENT :

The electrical requirement of meters shall be as specified in the relevant standards described in clause 2.0 of this specification.

41. ELECTROMAGNETIC COMPATIBILITY AND INTERFERENCE REQUIREMENT:

The meter shall meet EMI/EMC requirements as specified in the relevant standards described in clause 2.0 of this specification.

42. MECHANICAL REQUIREMENT :

The meter shall meet the mechanical requirements as specified in the relevant standards described in clause 2.0 of this specification.

43. CLIMATIC INFLUENCE REQUIREMENT:

The meter shall meet Dry Heat/Cold/Damp heat cyclic test requirements as per the relevant standards described in clause 2.0 of this specification.

44. RANDOM SAMPLE TESTING AFTER RECEIPT AT RETAIL OUTLETS.

a) The consignment of meters received at area retail outlets' shall be accepted only after successful testing of randomly selected meter samples at reputed independent laboratory like CPRI, ERDA etc. Meters shall be tested as per IS:9000/Relevant IEC standard/CBIP Tech. Report-88 (latest amended)/ this specification.

b) The sample of meters shall be selected randomly from the lot of meters supplied in each area retail outlets in approximately 2000: 1 ratio. This ratio can be changed by the purchaser. Meters received in an Area retail outlets shall be treated as a lot for random testing purpose. The samples will be selected by the purchaser's authorized officer / committee of officers. The samples so selected shall be sealed by seals/stickers, put in the primary packing of the meter and box (which shall be sealed by sticker seal) and then all the meters selected to be put in a bigger box and again sealed by sticker seals by the committee members.

If anyone sample fails in the testing, entire lot shall be rejected, which will have to be replaced by the supplier at his cost and an amount of Rs.l0/- per meter shall be recovered as incidental charges. However, at this stage re-sampling can be considered at request and cost of the supplier. In such case, samples in double numbers (than number of samples sent earlier) selected randomly will be sent for testing and testing charges shall be recovered from the supplier. If any of the samples fails again, entire lot will be rejected at his cost and an amount of Rs.l0/per meter shall be recovered as incidental charges.

On repeated failure of samples, purchase order shall be liable for cancellation

45. SAMPLES FOR TESTING (Conducted for evaluation of bid)

Two sample meters conforming to this specification duly sealed along with the

routine test certificates shall be furnished with the bid.

Note:- The main cover of one of the sample meters to be submitted along with the bid should be ultrasonically welded. The main cover of the other sample meter need not be ultrasonically welded, as at the time of sample testing, it shall be opened to ascertain conformity of meter's internal parts as per specification.

After start of supplies and within the contract period the owner at any time will select sample meters out of the Lots supplied to store /outlets of successful Bidders for testing at CPRI for conducting type tests and other tests as mentioned in this specification at the cost of utility. The Bidder's representative can also be present at the time of selection. If the meters fail in the tests, action will be initiated as per terms and conditions of bid documents.

46. QUALITY ASSURANCE PLAN

(A) The design life of the meter shall be 10 years and to prove the design life, the firm shall have at least the following quality Assurance Plan:

(i) The factory shall be completely dust proof.

(ii) The testing rooms shall be temperature and humidity controlled as per relevant standards.

(iii) The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.

(iv) Power supplies used in testing equipment shall be distortion free with sinusoidal wave - forms and maintaining constant voltage current and frequency as per the relevant standards.

(v) During the manufacturing of the meters the following checks shall be carried out.

a) Meter frame dimensions tolerance shall be minimum.

b) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

c) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

(B) The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. The information shall be separately given for individual type of material offered.

(i) Statement giving list of important raw materials, names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested! List of tests normally carried out on raw material in presence of bidder's representative and copies of test certificates.

(ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

(iii) List of manufacturing facilities available.

(iv) Level of automation achieved and list of areas where manual processing exists.

(v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and

inspections.

(vi) List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-a -vis the type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations provided with the tender.

(C) The outlets of manufacturer which pass the tests as per the clause 37(b) will be continued for a period of one year. The supplier shall maintain record of the issue of meters as per prevailing format and this can be checked by BESCOM representative of the officer of the rank of Executive Engineer at all reasonable times. If contract extended for more than one year any time after one year, the meters will again be picked up from the outlets at random and the meters will be tested at CPRI/NABL accredited labs at the cost of BESCOM.

If the meter fails in testing, the outlets are liable for closure. After 1 year of opening of outlets further renewal of contract is again subject to furnishing of valid type tests reports at the cost of supplier and price negotiations with BESCOM at that point of time. In case of any disagreement in cost/quality after one year, outlets will be closed and retendered. The supplier shall keep the outlets open for at least 6 months (after 1 year) or till such other alternative arrangements are made.

47. GUARANTEED TECHNICAL PARTICULARS

The bidder shall furnish all the necessary information as desired in the Guaranteed Technical Particulars. If the bidder desires to furnish any other information (s) in addition to the details as asked for, the same may be furnished.

48. PACKING AND FORWARDING

The meters shall be packed in cartons /crates suitable for vertical/horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Proper arrangement for lifting, such as lifting hooks or handles etc., shall be provided. Any material found short or broken inside the packing cases shall be supplied immediately by supplier without any extra cost.

The packing shall be done as per the manufacturer's standard practice. However, packing should be safe and water-proof and manufacturer should ensure the packing is such that, the material should not get damaged during transit by Rail/Road.

49. MAINTENANCE& GUARANTEE:

The Guarantee period of the offered meter shall be 66 months from the date of supply or 60 months from the date of installation whichever is earlier. The bidder shall replace the defective meters within a period of 3 days from the date of intimation from the concerned Consumer or from the BESCOM authorities. In case defective meters are not replaced in stipulated period the penalty as per clause of delay in delivery shall be applicable.

50. TESTS:

The test reports/certificate/records for all type tests specified having been successfully performed on the type of the meter offered shall be submitted with the tender. The bidder shall clearly bring out the deviations from this specification clause by clause whether on account of tests or manufacturing process or features incorporated in the meter. The tender lacking with above information and without supporting test reports for meter meeting the requirement of tests laid in this specification are likely to be rejected.

51. Real power should be sum of fundamental and harmonics.

52. Display resolution

Voltage – 0.01V
Current – 0.01A
Power factor -0.001
Active energy – 0.01 Kwh
Reactive energy – 0.01KVArh
Apparent energy – 0.01Kvah
Demand -0.001KVA

53. Type of display - The meter should have bright LCD electronic display with back lit with minimum description of parameters (eg., words like kWh, kVArh, (lag/ lead), kW, kVA pf, billing parameters like b01, b02….., TOD zone parameter t01, t02….)

Sd/-
General Manager Ele.,
Meter & Commercial,
BESCOM.